

## CLAIMS

- 1/ A joint prosthesis element for fixing to the joint surface of one of the bones of the joint after said joint surface has been subjected to appropriate resection
- 5 defining a projecting rim (22, 98, R, R<sub>1</sub>) over at least a portion of its outline, characterized in that said prosthesis element (10, 12, 50, 92, 200) is defined by a contact surface (C, C', 66, 202) for co-operating with the prosthesis element of the other bone of the joint,
- 10 said contact surface being substantially identical to the anatomical joint surface, a fixing surface for fixing to the resection of the joint surface, and a peripheral surface (P, P', 38, 74, 76, 102) interconnecting said contact and fixing surfaces, said peripheral surface
- 15 being designed, at least in part, to co-operate with the projecting rim of said resection, which rim corresponds to the cortical portion of the bone, said fixing surface being provided with fixing means (32, 34, 36, 60, 106, A, 208), the distance between said contact and fixing
- 20 surfaces in the central zone thereof and in a fixed direction being substantially constant, said peripheral interconnecting surface including at least some portions that flare relative to said fixing direction from the fixing surface towards the contact surface or from the
- 25 contact surface towards the fixing surface, whereby said peripheral surface portions bear against the corresponding portions of the rim of said resection.
- 2/ A prosthesis element according to claim 1,
- 30 characterized in that the fixing means comprise a layer of sealing or adhesive material, and in that the fixing surface has sufficient roughness to enhance adhesion of said material.
- 35 3/ A prosthesis element according to claim 1,  
characterized in that the fixing means comprise at least

one anchoring element projecting from the fixing surface and forming an integral part of said prosthesis element.

- 4/ A prosthesis element according to any one of claims 1  
5 to 3, characterized in that said fixing surface ( $F'$ ) is substantially plane, in that said contact surface ( $C'$ ) is also substantially plane and substantially parallel to the fixing surface, in that said anchoring elements are substantially orthogonal to said fixing surface, and in  
10 that said peripheral surface is at an angle  $\alpha$  lying in the range  $5^\circ$  to  $45^\circ$  with the direction normal to said contact surfaces, flaring towards said contact surface occupying said peripheral surface occupying substantially all of the outline of said contact and fixing surfaces.  
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- 5/ A prosthesis element according to claim 1,  
characterized in that said fixing surface is substantially plane, in that said contact surface is also substantially plane and substantially parallel to the  
20 fixing surface, in that said anchoring elements are substantially orthogonal to said fixing surface, and in that said peripheral surface is at an angle  $\alpha$  lying in the range  $5^\circ$  to  $45^\circ$  with the direction normal to said contact surfaces, flaring towards said fixing surface  
25 occupying said peripheral surface occupying substantially all of the outline of said contact and fixing surfaces.
- 6/ A prosthesis element according to claim 4 or 5,  
characterized in that said angle  $\alpha$  is determined so that  
30 at least 70% of the forces received by the prosthesis element are applied to the cortical portion of the bone.
- 7/ A prosthesis element according to claim 1,  
characterized in that the contact and fixing surfaces ( $C$ ,  
35  $F$ ) are defined in section on a first family of mutually parallel planes by a plurality of circular arcs ( $E_n$ ) that

are connected together tangentially, said circular arcs having distinct centers.

- 8/ A prosthesis element according to claim 1,  
5 characterized in that the contact and fixing surfaces (C,  
F) are defined in section on a first family of mutually  
parallel planes by a plurality of circular arcs (E<sub>n</sub>) that  
are connected together tangentially, and in that the  
section on said planes of the interconnecting peripheral  
10 surface (P) forms a contact angle b with the tangent at  
the end of the section of the contact surface where b  
lies in the range 5° to 85°, flaring towards said fixing  
surface.
- 15 9/ A prosthesis element according to any one of claims 1  
to 8, characterized in that said peripheral surface (P)  
is substantially in the form of a truncated cone of non-  
circular right section.
- 20 10/ A prosthesis element according to claim 3,  
characterized in that the anchoring element (A) comprises  
at least one peg of substantially frustoconical shape  
made out of the same material as the remainder of the  
prosthesis element.
- 25 11/ A prosthesis element according to claim 3,  
characterized in that said anchoring element is  
substantially dove-tailed in shape (208) projecting from  
said fixing face (204).
- 30 12/ A prosthesis element according to any one of claims 1  
to 11, characterized in that said distance between the  
fixing surface and the contact surface is at least 6 mm.
- 35 13/ A kit for putting a joint prosthesis element  
according to any one of claims 1 to 12 into place on a

joint surface of one of the bones of said joint, the kit being characterized in that it comprises:

- a set of similar ones of said prosthesis elements that differ in certain dimensions, each prosthesis element having a contact face for co-operating with a prosthesis of another type fixed on the other bone of said joint, a fixing face for fixing on said joint surface of the bone after it has been subjected to appropriate resection, said fixing face being provided with at least one anchoring element projecting from said face, and a peripheral surface interconnecting said contact and fixing surfaces, each prosthesis element being of substantially constant thickness between said two faces;
- a first set of template-forming means (136) for the outline of the resection, each template being associated with one of the prostheses of the set, each outline template having means for tracing the outline of the resection to be made, said outline corresponding to the periphery of said prosthesis element;
- a set of template-forming means for the anchoring holes (148), each template-forming means being associated with one of the prosthesis elements of the set, each anchoring hole template including means for positioning relative to the outline of the resection and means for tracing the location of the, or each, anchoring hole associated with the anchoring elements;
- a first set of instruments, for milling (140, 140', 142), for making said resection within said outline and for controlling milling parameters;
- a second set of instruments, for boring, for making said anchoring holes and controlling the boring parameters; and
- means for providing assistance in guiding the displacement of said instruments in such a manner that the milling instruments are displaced at least along said outline in such a manner that their axes remain

substantially parallel to a fixed direction, said direction being tied to said templates, and in such a manner that the drilling instruments are held on the same drilling axis.

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14/ A kit according to claim 13, characterized in that it further includes a set of test prosthesis elements, each test prosthesis element corresponding to a prosthesis element and having exactly the same shape, each test prosthesis element including putting into place means.

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15/ A method of manufacturing a joint prosthesis element according to any one of claims 1 to 12, the method being characterized in that it comprises the following steps:

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- taking a bone (120) having the exact shape of the joint surface of a natural bone for which the prosthesis is to be made;

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- milling a portion (122, 122') of the extremity of the bone in said joint surface while maintaining a constant milling direction so as to define a milled central zone and a peripheral surface, the depth of milling being substantially constant in said central zone, said peripheral surface defining at least in part a rim that projects from said central zone in the milling direction;

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- making a mold (130, 132, 154) having a mold cavity that is defined firstly by a first surface defining the contact surface and secondly by a second surface constituted by the fixing surface and said peripheral surface that result from the milling;

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- putting a molding material into said mold so as to take the shape of the mold cavity;

- unmolding the resulting piece, thereby obtaining a prototype for said prosthesis element; and

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- making said prosthesis element from said prosthesis.

- 16/ A method according to claim 15, characterized in that said first surface is identical in shape to the joint surface of the bone.
- 5 17/ A method according to claim 15, characterized in that said surface is distinct from the joint surface of the bone and is shaped so as to reduce the degrees of freedom of the joint of which the bone forms a part.